UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/719,065	11/24/2003	Johannes Catharinus Hubertus Mulkens	081468-0306886	9148

909 7590 05/15/2007
PILLSBURY WINTHROP SHAW PITTMAN, LLP
P.O. BOX 10500
MCLEAN, VA 22102

EXAMINER	
KIM, PETER B	

ART UNIT	PAPER NUMBER
2851	

MAIL DATE	DELIVERY MODE
05/15/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/719,065	HUBERTUS MULKENS ET AL.	
	Examiner	Art Unit	
	Peter B. Kim	2851	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 February 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-11,13-55 and 62* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-11,13-55 and 62* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☒ Certified copies of the priority documents have been received in Application No. 09/866,875.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *11/2006*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Applicant's arguments filed on Feb. 23, 2007 have been fully considered.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 10, 11, 37 and 38 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The claims do not specify the medium in which the speed of sound is measured, and thus, the speed at which the absorbent gas enters is not clearly claimed.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 26-34, 36, 39, 41, 43, 44, 47, 48, and 52-55 are rejected under 35 U.S.C. 102(e) as being anticipated by Nishi (6,545,746).

Regarding claims 26, 28, 34, 47, 48, 52-54 and 55, Nishi discloses a lithographic projection apparatus and a device manufacturing method comprising a radiation system (111) a support structure (112) for supporting a patterning structure, a substrate table (114), a projection system (113) and a radiation absorber comprising a gas supply to supply an absorbent gas at a controlled concentration in the evacuated optical path (col. 35, line 56 – col. 36, line 47), the absorbent gas absorbing radiation energy by increasing gas pressure (col. 35, line 56 – col. 36, line 47) to absorb radiation during exposure of the radiation sensitive material to the patterned beam to adjust one of: radiation power emitted by a radiation source configured to supply radiation to the radiation system; the uniformity of energy of the beam of radiation perpendicular to an optical axis of the apparatus; radiation energy of pulses of radiation emitted by the radiation source; duration of an exposure of a target portion; angular distribution of the radiation energy delivered by the beam of radiation (col. 35, line 55-60); and a radiation-energy detector or sensor proximate to the enclosure providing an output signal and energy profile that is proportional to an amount of interaction of the projection beam with the absorbent gas (col. 35, line 56 – col. 36, line 47, in order to control the control the amount of light and to obtain desirable amount, a detector must be provided. Also, see col. 17, lines 32-42).

Regarding claims 27, 41 and 43, Nishi discloses the radiation-energy detector or sensor located proximate one of a pupil plane, a plane of patterning structure, a plane of the substrate; a conjugate plane of the pupil plane; a conjugate plane of the patterning structure plane; and a conjugate plane of the substrate plane (Fig. 1 and 8, col. 17, lines 32-42, col. 28, lines 8-14). Regarding claim 31, Nishi discloses the radiation-energy detector comprising an enclosure surrounding at least one volume and transparent to beam of radiation (Fig. 8 and 9, col. 28, lines

9-65, col. 32, line 46 – col. 34, line 60). Regarding claims 32 and 33, the projection system of Nishi discloses a first aperture to allow radiation to enter and a second aperture to allow radiation to exit (Fig. 8, 9, 12 and 13) and the absorption by gas is substantially located at the focal point (col. 32, line 46 – col. 34, line 60, col. 35, line 56 – col. 36, line 47). Regarding claim 36, Nishi also teaches gas extractor (Fig. 9, col. 35, line 56 – col. 36, line 47). Since any gas in an enclosure will eventually reach an equilibrium in concentration, the concentration of the gas in Nishi would be symmetric about the optical axis. Nishi also discloses controlling one of the property of the absorbent gas (col. 36, lines 1-43).

Regarding claims 29, 30, 39 and 44, Nishi discloses the absorbent gas comprising oxygen, helium and nitrogen (col. 36, lines 44-46, col. 45, lines 17-42), mixed with purge gas (col. 45, lines 17-67), and radiation comprising wavelength less than 365 nm (KrF and ArFcol. 14, lines 6-20), and the detector, which detects ultraviolet light. Nishi discloses radiation-energy detector to determine energy of radiation passing through a region of interactive gas (col. 35, line 56 – col. 36, line 47, in order to control the control the amount of light and to obtain desirable amount, a detector must be provided, thus such detector is inherent to the invention of Nishi). Nishi discloses a concentration controlled volume of radiation absorbent gas to be traversed by the beam of radiation (col. 35, line 56- col. 36, line 47, and col. 45, lines 17-67). Nishi supplies and controls absorbent gas to effect a desired non-uniform attenuation (col. 35, line 56- col. 63, line 47, and col. 45, lines 17-67). Nishi discloses a device (w) manufactured according to the method above.

Claims 26, 27, 30, 52, 54 and 55 are rejected under 35 U.S.C. 102(e) as being anticipated by Mori et al. (Mori) (2001/0030740).

Mori discloses a lithographic projection apparatus and a device manufacturing method comprising a radiation system with wavelength less than 365 nm (10 and para 0044) a support structure (107) for supporting a patterning structure (20), a substrate table (23), a projection system (21) and a radiation-energy detector or sensor (24) proximate to a conjugate plane of the substrate plane (Fig. 1) providing an output signal that is proportional to an amount of interaction of the projection beam with the absorbent gas (Mori discloses in para 0081, inert gas inside the projection system. Since there is some absorption of illumination light with inert gas, the illumination detected by the sensor 24 would provide an output that is proportional to an mount of interaction of the beam of radiation with the region of the gas).

Claims 26-34, 36, 39, 41, 43, 44, 47, 48, and 52-55 are rejected under 35 U.S.C. 102(b) as being anticipated by Shiozawa (JP-11-354409).

Regarding claims 26, 28, 34, 47, 48, 52-54 and 55, Shiozawa discloses a lithographic projection apparatus and a device manufacturing method comprising a radiation system (1) a support structure (not shown) for supporting a patterning structure (11), a substrate table (15), a projection system (12) and a radiation absorber comprising a gas supply to supply an absorbent gas at a controlled concentration in the evacuated optical path (Fig. 3, 5 and abstract), the absorbent gas absorbing radiation energy by increasing gas pressure (col. 35, line 56 – col. 36, line 47) to absorb radiation during exposure of the radiation sensitive material to the patterned beam to adjust one of: radiation power emitted by a radiation source configured to supply radiation to the radiation system; the uniformity of energy of the beam of radiation

perpendicular to an optical axis of the apparatus; radiation energy of pulses of radiation emitted by the radiation source; duration of an exposure of a target portion; angular distribution of the radiation energy delivered by the beam of radiation (Fig. 1, 3, abstract, and para 0037, 0038); and a radiation-energy detector or sensor (16) proximate to the enclosure providing an output signal and energy profile that is proportional to an amount of interaction of the projection beam with the absorbent gas (para 0057, abstract).

Regarding claims 27, 41 and 43, Shiozawa discloses the radiation-energy detector or sensor located proximate one of a pupil plane, a plane of patterning structure, a plane of the substrate; a conjugate plane of the pupil plane; a conjugate plane of the patterning structure plane; and a conjugate plane of the substrate plane (Fig. 1, para 0057). Regarding claim 31, Shiozawa discloses the radiation-energy detector comprising an enclosure surrounding at least one volume and transparent to beam of radiation (Fig. 1, 3, 5 and abstract). Regarding claims 32 and 33, the projection system of Shiozawa discloses a first aperture to allow radiation to enter and a second aperture to allow radiation to exit (Fig. 1) and the absorption by gas is substantially located at the focal point (Fig. 1, 3, 5, abstract and para 0060-0062). Regarding claim 36, Shiozawa also teaches gas extractor (Fig. 3, 5, para 0060-0062). Since any gas in an enclosure will eventually reach an equilibrium in concentration, the concentration of the gas in Shiozawa would be symmetric about the optical axis. Shiozawa also discloses controlling one of the property of the absorbent gas by controlling the gas pressure and composition (para 0037, 0038).

Regarding claims 29, 30, 39 and 44, Shiozawa discloses the absorbent gas comprising oxygen (abstract), mixed with purge gas (abstract), and radiation comprising wavelength less than 365 nm (para 0025), and the detector (16), which detects ultraviolet light. Shiozawa

discloses radiation-energy detector to determine energy of radiation passing through a region of interactive gas (para 0057). Shiozawa discloses a concentration controlled volume of radiation absorbent gas to be traversed by the beam of radiation (Fig. 1, abstract). Shiozawa supplies and controls absorbent gas to effect a desired non-uniform attenuation (abstract). Shiozawa discloses a device (13) manufactured according to the method above.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 35 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nishi in view of Tanaka et al. (Tanaka) (2003/0020888).

Nishi discloses the claimed invention as discussed above; however, Nishi does not disclose radiation in the rage of 5-20 nm and a detector to detect such radiation. Tanaka discloses providing EUV light to a lithographic apparatus (para 0187). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide EUV light and a detector to detect such light to the invention of Nishi in order to improve the resolution of the exposed pattern.

Claims 45 and 46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nishi in view of Kley (6,353,219).

Nishi discloses the claimed invention as discussed above; however, Nishi does not disclose the sensor comprises an electrode which is charged at a potential opposite to a charged particle to which it is sensitive. Kley discloses in col. 53, lines 31-56, a radiation energy sensor including an electrode and sensitive to a charged particle which is opposite in sign. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide the sensor of Kley to the invention of Nishi in order to facilitate analysis of the output signal through the controller as taught by Kley in col. 53, lines 15-30.

Claims 1-7, 9, 13-17, 20-22, 24, 25, 50, 51 and 62 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shiozawa (JP 11-354409) in view of Nishi et al. (Nishi) (6,414,743).

Regarding claims 1, 2, 6, 7, 13, 14, 24, 25, 50, 51 and 62, Shiozawa discloses, discloses a lithographic projection apparatus and a device manufacturing method comprising a radiation system (1) providing radiation comprising a wavelengths less than 365 nm (para 0025) in evacuated path (Fig. 1) a support structure (not shown) for supporting a patterning structure (11), a substrate table (15), a projection system (12) and a radiation absorber comprising a gas supply to supply an absorbent gas at a controlled concentration (Fig. 3, 5, and abstract) to absorb radiation during exposure of the radiation sensitive material to the patterned beam to adjust one of: radiation power emitted by a radiation source configured to supply radiation to the radiation system; the uniformity of energy of the beam of radiation perpendicular to an optical axis of the apparatus; radiation energy of pulses of radiation emitted by the radiation source; duration of an exposure of a target portion; and angular distribution of the radiation energy delivered by the beam of radiation (Fig. 1, 3, abstract, and para 0037, 0038); and the absorbent gas comprising

oxygen (abstract), mixed with purge gas (abstract), and the detector (16), which detects ultraviolet light (para 0025). Shiozawa discloses radiation-energy detector to determine energy of radiation passing through a region of interactive gas (16, para 0057). Shiozawa discloses a concentration controlled volume of radiation absorbent gas to be traversed by the beam of radiation (abstract). Shiozawa supplies and controls absorbent gas to effect a desired non-uniform attenuation (abstract).

Regarding claims 3, 17 and 19, Shiozawa discloses the radiation absorber located proximate one of a pupil plane, a plane of patterning structure, a plane of the substrate; a conjugate plane of the pupil plane; a conjugate plane of the patterning structure plane; and a conjugate plane of the substrate plane (Fig. 1, 3, 5, abstract). Regarding claim 4, Shiozawa discloses absorber comprising an enclosure surrounding at least one volume and transparent to beam of radiation (Fig. 1, 3, 5, abstract). Regarding claim 5, the projection system of Shiozawa discloses a first aperture to allow radiation to enter and a second aperture to allow radiation to exit (Fig. 1, 3, 5 abstract). Regarding claim 9, Shiozawa teaches gas extractor (Fig. 3, 5, para 0060-0062). Regarding claim 15 and 16, since any gas in an enclosure will eventually reach an equilibrium in concentration, the concentration of the gas in 822 would be symmetric about the optical axis. Regarding claims 21 and 22, Shiozawa discloses controlling one of the property of the absorbent gas by controlling the gas pressure and composition (para 0037, 0038).

However, Shiozawa does not disclose that the absorbent gas comprises one of water or hydrocarbons. Nishi discloses in col. 19, line 50 – col. 20, line 3, that oxygen as well as water and hydrocarbon absorb radiation. Therefore, it would have been obvious to one of ordinary skill in the at the time of the invention to provide water or hydrocarbon instead of oxygen as

absorbent gas because water and hydrocarbon are known to have the same desired properties as oxygen and it would make an appropriate substitute.

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 1-7, 9, 13, 15-19, 21-26, 29, 31-34, 36, 39, 40-43, 47-55, and 62 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims1, 2, and 5-23 of U.S. Patent No. 6,538,716 ("716"). Although the conflicting claims are not identical, they are not patentably distinct from each other because the current claims are broader and thus fully met by the prior patent. For example, 716 also claims a gas composition sensor which is not claimed in the current claims.

Claims 8, 14, 30 and 35 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1, 5, 7, and 19 of U.S. Patent No. 6,538,716 (716) in view of Tanaka et al. (Tanaka). As indicated above 716 claims to an invention not

patentably distinct from the current claims; however, 716 does not claim radiation in the rage of 5-20 nm and in the range of less than 365 nm and a detector to detect such radiation. Tanaka discloses providing EUV light and ArF and KrF laser to a lithographic apparatus (para 0187). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide EUV light and ArF and KrF a detector to detect such light to the claims of 716 in order to improve the resolution of the exposed pattern.

Response to Arguments

In response to applicant's arguments the rejection based on JP 2003257822 is withdrawn, and Shiozawa reference is used instead.

Applicant argues that Nishi (6,545,746) does not inherently disclose the radiation-energy detector. Nishi discloses in col. 35, lines 55-60, "light quantity control method according to this embodiment will be described below." Nishi also discloses in col. 36, lines 9-16, "the illuminating light IL, to be continuously controlled in a predetermined range", and in the same section, Nishi teaches reducing or increasing the amount of illuminating lighting. In order to continuously control the light and to determine that the amount of lighting must be increased or decreased required a radiation-energy detector. Without a detector, Nishi would not be able to determine whether the amount of lighting must be increased or decreased. In order to control the lighting, a detector is required.

Applicant argues that Mori does not measure the amount of interaction of the radiation with the gas since other factors can affect the Mori's transmittance value. The value of all radiation-sensor detectors are affected by lens material, contamination, temperature etc...

Unless applicant is arguing that the detector of the claimed invention is somehow not affected at all by lens material, contamination, temperature, etc..., the detector of Mori detects the amount of radiation energy proportional to the amount of interaction of the beam just as it is claimed in the current application. Since it is not the detector but the light which is affected by absorbent gas, lens material, contamination, temperature, etc..., applicant's argument is unpersuasive. The detector of Mori detects the amount of radiation which has been affected by gas, lens material, contamination, temperature, etc..., and if more absorbent gas is added to the path of the light, the detector would detect less amount of light in proportion to the amount of gas which was added to the path.

Applicant further argues that Nishi and Kley are not of analogous art. However, the relevant issue is the sensor. Both Nishi and Kely are relevant to relevant energy sensor, and thus, are analogous.

Regarding the double patenting rejection, as applicant traverses the rejection for similar reasons as provided in the applicant's previous response, the response from the previous office action is repeated. Applicant's arguments are unclear because the rejection clearly states that the claims of the current application are broader because the claims of the previous patent includes all of the limitation of the current claims and also includes a limitation which is not claimed in the current application. For example, claims 1 and 19 of the previous patent claim projection apparatus and a device manufacturing method comprising a radiation system, a support structure to support patterning structure, a substrate table, a projection system, and a radiation control mechanism responsive to gas composition to control the radiation energy, which is radiation absorber of claim 1 in the current application. Further, claim 5 of the previous

patent claims an energy sensor, and claim 22 of the previous patent claims absorber gas of hydrocarbons. Claim 1 and 19 of the previous patent is narrower because those claims have a limitations not found in the claims of the current application, which is a gas composition sensor. Thus, the claims of the current application are broader and thus fully met by the prior patent.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Peter B. Kim whose telephone number is (571) 272-2120. The examiner can normally be reached on 9:00 AM - 6:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Diane Lee can be reached on (571) 272-2399. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Peter B. Kim
Primary Examiner
Art Unit 2851

May 7, 2007